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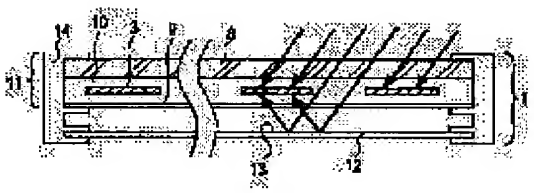
(54) DOUBLE-SIDE GENERATION TYPE SOLAR BATTERY MODULE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a double-side generation type solar battery module for reducing costs and weight by increasing the amount of generation per cell and reducing the number of cells.
SOLUTION: The double-side generation type solar battery module comprises a plurality of cell rows 4 where each of a plurality of double-side generation type solar battery cells 3 are arranged in one direction adjacently one another, a light transmission section 5 that is extended in one direction between cells 4 that are formed by separating the adjacent cell rows 4 in a direction for othrogonally crossing, and a reflection plate 12 for reflecting light that is transmitted from the front to the rear of the light transmission section 5 to the rear of the solar battery cells 3. Light that is transmitted through the light transmission section 5 and is reflected by the reflection plate 12 is equally applied to the rear of each cell 3.



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*NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The double-sided generation-of-electrical-energy mold solar cell module characterized by to have the translucent part prolonged in said one direction between two or more cel trains which two or more double-sided generation-of-electrical-energy mold photovoltaic cells were made to approach an one direction, and put them in order, respectively, and the cel train formed by isolating the adjoining cel train in the direction which intersects perpendicularly with said one direction, and to have carrying out incidence of the light which penetrated this translucent part on the background from the side front to the rear-face side of a photovoltaic cell.
[Claim 2] The double-sided generation-of-electrical-energy mold solar cell module according to claim 1 characterized by having the reflecting plate made to reflect in the rear face of a photovoltaic cell the light which penetrated said translucent part on the background from the side front.
[Claim 3] It is the double-sided generation-of-electrical-energy mold solar cell module according to claim 1 or 2 arranged so that a photovoltaic cell may approach in the vertical direction and may be isolated horizontally.
[Claim 4] It is the double-sided generation-of-electrical-energy mold solar cell module according to claim 1 or 2 arranged so that a photovoltaic cell may approach horizontally and may be isolated in the vertical direction.
[Claim 5] The double-sided generation-of-electrical-energy mold solar cell module according to claim 4 which has the lobe to which a reflecting plate projects in a photovoltaic cell side in the height of the margo inferior of a photovoltaic cell.
[Claim 6] A double-sided generation-of-electrical-energy mold solar cell module given in claim 2 which a reflecting plate becomes from refractory material thru/or any 1 term of 5.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a double-sided generation-of-electrical-energy mold solar cell module.
[0002]
[Description of the Prior Art] Photovoltaic cell (only henceforth cel) spacing is packed, and he arranges many cels as much as possible, and is trying to transform into the electrical and electric equipment the light energy in which each cel carries out incidence from the side front in the conventional solar cell module (only henceforth a module).
[0003] The double-sided generation-of-electrical-energy mold photovoltaic cell generated by the light which it is discovered that the light which carries out incidence from a cel rear face on the other hand besides the generation of electrical energy by the light which carries out incidence from the side front of a cel also generates electricity, and carries out incidence from front flesh-side both sides has come to be put in practical use.
[0004] In the solar-battery generation-of-electrical-energy facility using this double-sided generation-of-electrical-energy mold photovoltaic cell, the module which stuffed the cel as usual, and the scattered light by which the solar-battery array which was mutually close and put this in order was installed, carried out incidence to that bottom from the margo inferior of a module or a solar-battery array, and scattered reflection was carried out with the ground, a roofing tile, etc. are made to carry out incidence to the rear face of a double-sided generation-of-electrical-energy mold photovoltaic cell.
[0005]
[Problem(s) to be Solved by the Invention] However, since the light which a module and a solar-battery array make a shadow from the module and solar-battery array bottom, and carries out incidence to the rear-face side of a cel becomes weak few, the generating efficiency per cel is not raised, so that it is expected, but the number of cels about the same as the case of an one side generation of electrical energy is needed, and the technical problem that attaining cost cut by reduction of the number of cels and modular lightweight-ization can seldom expect occurs.
[0006] This invention solves the technical problem of this conventional technique, increases the amount of generations of electrical energy per cel, and aims at offering the solar cell module which reduces the number of cels and enabled it to attain cost cut and modular lightweight-ization.
[0007]
[Means for Solving the Problem] It is characterized by making the rear face of a photovoltaic cell carry out incidence of the light which penetrated the translucent part prolonged in said one direction between two or more cel trains which the double-sided generation-of-electrical-energy mold photovoltaic cell of plurality [this invention] respectively was made to approach an one direction in order to attain this purpose, and were put in order, and the cel train formed by isolating the adjoining cel train in the direction which intersects perpendicularly with said one direction, and this translucent part on the background from the side front.
[0008] This invention is good to have further the reflecting plate made to reflect in the rear face of a photovoltaic cell the light which penetrated said translucent part on the background from the side front.
[0009] According to this, incidence of a part of light which carried out incidence to the modular side front is directly carried out on the surface of a cel, and the remainder penetrates a translucent part and it carries out incidence to a reflecting plate. The remainder is reflected in the rear face of a cel although a part of light which carried out incidence to the reflecting plate is reflected toward a translucent part.
[0010] Since the translucent part is arranged between cel trains, as a result of generating electricity by the light in which light will carry out [light] incidence like the rear face of each modular cel, and each cel carried out incidence from the rear face similarly, the amount of generations of electrical energy per cel increases, and even if it reduces the number of cels, sufficient amount of generations of electrical energy comes to be obtained.
[0011] Even if especially the direction that a cel is made to approach and puts it in order is not limited but is horizontal, it may be the vertical direction which intersects perpendicularly with this.
[0012] The reflector in which a reflecting plate reflects the light which has penetrated the translucent part may be a split face as the reflected light is scattered, but as a lot of possible light is reflected toward a cel rear face, it may be a mirror plane.
[0013] Moreover, when a cel approaches horizontally, and standing perpendicularly the module arranged so that it may be isolated in the vertical direction and installing it in it If it has the lobe to which a reflecting plate projects in a photovoltaic cell side in the height of the margo inferior of a photovoltaic cell, since incidence is carried out from an upper translucent part, and the light reflected toward the lower translucent part can be re-reflected by the lobe, it can make the rear face of a cel able to carry out incidence and the amount of generations of electrical energy can be made to increase, it is advantageous.
[0014] By the way, by the module using this double-sided generation-of-electrical-energy mold photovoltaic cell, although the resin seal of the cel is carried out between the transparence plate for surface protections, and the bright film for rear-face protection, if it is made for this bright film to scatter the transmitted light, it is reflected with a reflecting plate and the glare of the light which penetrates a translucent part and carries out outgoing radiation to a modular side front can be attenuated. For example, without decreasing most quantity of lights which penetrate a translucent part and carry out incidence to a reflecting plate, if the irregularity by the time of film

shaping, embossing after film shaping, etc. is formed, when penetrating this bright film, light can be scattered.
[0015]
[The mode of implementation of invention] Hereafter, the double-sided generation-of-electrical-energy mold solar cell module concerning one example of this invention is concretely explained based on a drawing.
[0016] With the photovoltaics equipment shown in the perspective view of drawing 1 , the solar cell module 1 concerning one example of this invention arranges two top faces in north and south on the stand 2 which made the east riser incline, and is arranged. To each module 1, for example, the cel train 4 of plurality (for example, four trains) which the double-sided generation-of-electrical-energy mold photovoltaic cell 3 of plurality (for example, 12 pieces) which consists of a HIT solar battery was made to approach the one direction of the vertical direction of east and west, i.e., the direction, and put it in order, The translucent part 5 prolonged in said one direction between the cel trains 4 formed by isolating the adjoining cel train 4 in horizontally [horizontally of north and south it intersects perpendicularly with said one direction], i.e., the direction, is formed.
[0017] The spacing with the width of face of this translucent part 5 are 88mm and same also between the cel train 4 of right-and-left both ends and the frame 14 mentioned later is kept.
[0018] As shown in the top view of drawing 2 , the double-sided generation-of-electrical-energy mold photovoltaic cell 3 of each train is connected to a serial by the copper foil lead 6 which carried out solder plating to copper foil, and each cel train 4 is connected to a serial with the copper foil lead 6 among one pair of terminals prepared for example, in the terminal box 7 established in the modular rear face.
[0019] As shown in the sectional view of drawing 3 , the closure of these double-sided generation-of-electrical-energy mold photovoltaic cell 3 and the copper foil lead is carried out by the resin 10 which consists of ethylene vinyl acetate (EVA) between the translucency facing 8 which consists of glass, and the translucency flesh-side facing 9 which consists of polyethylene terephthalate (PET), and they constitute the translucency module 11 with these translucency facing 8, the translucency flesh-side facing 9, and resin 10.
[0020] The reflecting plate 12 which separates the suitable space for the rear-face side of this translucency module 11, and consists of refractory material, for example, an aluminum plate, is arranged, and the field 13 by the side of the translucency module of this reflecting plate 12, i.e., the reflector which carried out mirror plane finishing in respect of the side front, is constituted.
[0021] And said solar cell module 1 which is with these translucency module 11, a reflecting plate 12, and the frame 14 incorporating these that consists of aluminum extrusion mold material, for example, for example, is equipped with the vertical lay length of 1320mm and a dimension (henceforth a gage) with a horizontal width of face of 895mm is constituted.
[0022] Thus, a translucent part 5 is formed, eight trains of cel trains 4 which consist of 12 cels 3 by the conventional module of a gage will be arranged in the cel train 4 which consists of 12 cels 3 by 4 successive installation beam each module 1 using 48 cels 3, and 50% of cels 3 will be reduced to a total of 96 cels 3 being used.
[0023] Now, if sunlight carries out incidence to said photovoltaics equipment, incidence of the part will be directly carried out to each cel 3 from a side front, and it will be changed into the electrical and electric equipment. The remaining sunlight penetrates a translucent part 5, it carries out incidence to a reflecting plate 12, and it is reflected in a reflector 13. Although outgoing radiation of a part of this reflected light is carried out to a side front through the translucent part 5 along which it has passed previously, or the other translucent parts 5, incidence of a part of [at least] reflected lights is carried out to the rear face of the close cel 3, and they are changed into the electrical and electric equipment.
[0024] Here, since the translucent part 5 is arranged between the cel trains 4, as a result of generating electricity by the light in which light will carry out [light] incidence like the rear face of each cel 3 of a module 1, and each cel 3 carried out incidence from the rear face similarly, the amount of generations of electrical energy per cel increases, and even if it reduces the number of cels, the required amount of generations of electrical energy comes to be obtained.
[0025] The solar-battery output of this example is set to 122W, to the solar-battery output of the module of the conventional one side generation-of-electrical-energy mold using 96 cels 3 mentioned above being 180W, 67.8% of output was obtained and the amount of generations of electrical energy per cel is raised clearly. Therefore, while being able to reduce the number of cels required for obtaining a necessary output and being able to aim at a cost cut, modular lightweight-ization can be attained.
[0026] It can attain modular lightweight-ization while especially the number of the cels 3 used for the module 1 of one sheet in this invention is not limited, for example, can raise the amount of generations of electrical energy per cel for the cel train 4 which put 12 cels 3 in order three trains thru/or by arranging seven trains by the module 1 of a gage, can reduce the number of cels required for obtaining a necessary output and can aim at a cost cut.
[0027] If the cel train 4 is made into seven trains and 177.35W (98.5% of the conventional example) and the cel train 4 will specifically be made into six trains in 84 cels (87.5% of the conventional example) 3 If 163.49W (90.8% of the conventional example) and the cel train 4 are made into five trains in 72 cels (75% of the conventional example) 3 If 144.9W (80.5% of the conventional example) and the cel train 4 are made into three trains in 60 cels (62.5% of the conventional example) 3, the output of 96.2W (53.4% of the conventional example) will be obtained in 36 cels (37.5% of the conventional example) 3.
[0028] Although the mirror plane is made to said reflector 13, you may make it raise the reflective effectiveness of a reflector 13 in this example by replacing with this and performing high reflective processing of white paint, clear paint, etc.
[0029] Moreover, it is also possible to scatter the reflected light which formed the reflector 13 in the split face thru/or the concave convex, and was reflected this and reversely by hairline processing, crimp processing, embossing, etc. in the reflector 13. In this case, while being able to equalize the quantity of light which carries out incidence at the rear face of a cel 3 and being able to raise a cel property to it uniformly, it is reflected in a reflector and the glare of the light by which outgoing radiation is carried out from a module 1 through a translucent part 5 is stopped. As especially shown in the perspective view of drawing 4 and the sectional view of drawing 5 or the perspective view of drawing 6 , and the sectional view of drawing 7 , when forming a reflector 13 in a concave convex by carrying out irregularity of the reflecting plate 12 by embossing etc., the effectiveness that the reinforcement of a reflecting plate 12 is raised is also acquired.
[0030] Furthermore, since the aluminum plate which is an incombustible material constitutes the reflecting plate 12 from this example, fire resistance efficiency is high and it can use also as the outer wall material as which refractoriness is required, or roofing material.
[0031] In addition, in this example, as shown in the sectional view of drawing 8 , even if it carries out irregularity of the translucency flesh-side facing 9 by embossing, it is reflected in a reflector and the glare of the light by which outgoing radiation is carried out from a

module 1 through a translucent part 5 can be stopped.
[0032] In addition, although the quantity of light which carries out incidence to the background of a cel 3 at the time of meridian transit will become the minimum if this module 1 is arranged to the south sense, it is reflected in the background of a cel 3 according to a diffraction operation in a surroundings lump and a reflector 13, and some light carries out incidence to the rear face of a cel 3. Moreover, a translucent part 5 is penetrated in addition to the time of meridian transit, it can expect that the light reflected in the reflector 13 will carry out incidence to the rear face of a cel 3, and the stable amount of generations of electrical energy with little fluctuation of the amount of generations of electrical energy is obtained over many time zones through a day.
[0033] In the double-sided generation-of-electrical-energy mold solar cell module 1 concerning other examples of this invention shown in the front view of drawing 9 , and the sectional view of drawing 10 , the cel train 4 which approached horizontally and put the cel 3 in order opens spacing in the vertical direction, and is arranged.
[0034] If the lobe 15 to which a reflecting plate 12 projects in a photovoltaic cell 3 side in the height of the margo inferior of a photovoltaic cell 3 is formed, and a module 1 is stood perpendicularly and installed in this example as shown in the sectional view of drawing 11 Since the utilization factor of the light which is reflected in said reflector 13, the light which goes to the translucent part 5 of the cel 3 bottom will be reflected on the top face of a lobe 15, will carry out incidence to the rear face of a cel 3, and penetrated the translucent part 5 to the rear-face side is raised, it is advantageous.
[0035] Although really formed in the reflecting plate 12 of extrusion molding at a single string, what was formed in other parts and another objects of a reflecting plate 12 is sufficient as this height 15, and it may be formed by bending a reflecting plate 12 in a continuous wave form, as shown in the sectional view of drawing 12 .
[0036] In this case, the reflective direction of the reflected light can be controlled and the rear face of a cel 3 can be made to carry out incidence of all the light that penetrated the translucent part 5 equally over the whole surface by forming the part of slanting facing up of a reflector 13 in a convex surface, or forming it in a concave bend side.
[0037] Since the configuration of others of this example, an operation, or effectiveness is the same as a precedent, it omits in order to avoid duplication.
[0038] In the above-mentioned operation gestalt, it constituted so that the light which penetrated the translucent part on the background from the side front with the reflecting plate might be reflected in the rear face of a photovoltaic cell, but it can also constitute so that scatter reflection of the light penetrated on the background from the side front may be carried out on the ground, the wall surface of a roofing tile or a building, etc. from a translucent part, without forming a reflecting plate and incidence of the light may be carried out.
[0039]
[Effect of the Invention] As explained above, the solar cell module of this invention Two or more cel trains which two or more double-sided generation-of-electrical-energy mold photovoltaic cells were made to approach an one direction, and put them in order, respectively, Since it has the translucent part prolonged in said one direction between the cel trains formed by isolating the adjoining cel train in the direction which intersects perpendicularly with said one direction, and the reflecting plate which reflects in the rear face of a photovoltaic cell the light which penetrated this translucent part on the background from the side front By penetrating a translucent part at the rear face of each cel, and carrying out incidence of the light reflected with the reflecting plate, incidence of the light can be carried out to both sides of a cel, they can be made to be able to generate it regardless of the location where the cel is arranged, and the amount of generations of electrical energy per cel can be raised.
[0040] Consequently, the number of cels per module is lessened, and a modular price can be made cheap, and the effectiveness of being able to lightweight-ize a module can be acquired.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective view of the solar-battery facility equipment using this invention.
[Drawing 2] It is the front view of this invention.
[Drawing 3] It is the A-A line sectional view of drawing 1 .
[Drawing 4] It is the perspective view of the reflecting plate of this invention.
[Drawing 5] It is the B-B line sectional view of drawing 4 .
[Drawing 6] It is the perspective view of the reflecting plate of this invention.
[Drawing 7] It is the C-C line sectional view of drawing 6 .
[Drawing 8] It is the sectional view of this invention.
[Drawing 9] It is the front view of this invention.
[Drawing 10] It is D-D line sectional view of drawing 9 .
[Drawing 11] It is the sectional view of this invention.
[Drawing 12] It is the sectional view of this invention.
[Description of Notations]
1 Double-sided Generation-of-Electrical-Energy Mold Solar Cell Module
3 Photovoltaic Cell
4 Cel Train
5 Translucent Part
12 Reflecting Plate
15 Lobe

[Translation done.]

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審査請求　未請求　請求項の数６　ＯＬ　（全６頁）

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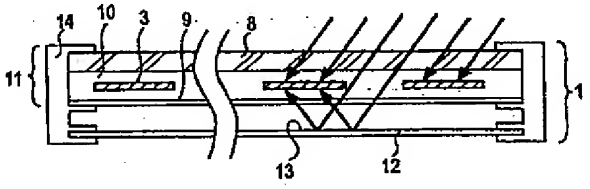
(54)【発明の名称】　両面発電型太陽電池モジュール

(57)【要約】
【課題】　両面発電型太陽電池モジュールに係り、セル１個当たりの発電量を高め、セル数を削減してコストダウン及びモジュールの軽量化を図ることができる両面発電型太陽電池モジュールの提供を目的とする。
【解決手段】　それぞれ複数の両面発電型太陽電池セル３を一方向に接近させて並べた複数のセル列４と、隣接するセル列４を前記一方向に直交する方向に離隔することにより形成されたセル列４の間で前記一方向に延びる透光部５と、この透光部５を表側から裏側に透過した光を太陽電池セル３の裏面に反射する反射板１２とを備え、透光部５を透過し、反射板１２で反射された光を各セル３の裏面に均等に入射させる。



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【特許請求の範囲】
【請求項１】　それぞれ複数の両面発電型太陽電池セルを一方向に接近させて並べた複数のセル列と、隣接するセル列を前記一方向に直交する方向に離隔することにより形成されたセル列の間で前記一方向に延びる透光部と、を備え、この透光部を表側から裏側に透過した光を太陽電池セルの裏面側に入射させることを備えることを特徴とする両面発電型太陽電池モジュール。
【請求項２】　前記透光部を表側から裏側に透過した光を太陽電池セルの裏面に反射させる反射板を備えることを特徴とする請求項１に記載の両面発電型太陽電池モジュール。
【請求項３】太陽電池セルが上下方向には接近し、水平方向には離隔するように配置される請求項１又は２に記載の両面発電型太陽電池モジュール。
【請求項４】　太陽電池セルが水平方向には接近し、上下方向には離隔するように配置される請求項１又は２に記載の両面発電型太陽電池モジュール。
【請求項５】　反射板が太陽電池セルの下縁の高さで太陽電池セル側に突出する突出部を有する請求項４に記載の両面発電型太陽電池モジュール。
【請求項６】　反射板が耐火材からなる請求項２ないし５のいずれか１項に記載の両面発電型太陽電池モジュール。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、両面発電型太陽電池モジュールに関する。
【０００２】
【従来の技術】従来の太陽電池モジュール（以下、単にモジュールという。）では、太陽電池セル（以下、単にセルという。）の間隔を詰めてできるだけ多数のセルを配置し、各セルがその表側から入射する光エネルギーを電気に変換するようにしている。
【０００３】一方、セルの表側から入射する光による発電の他に、セル裏面から入射する光によっても発電されることが発見され、表裏両面から入射する光により発電する両面発電型太陽電池セルが実用化されるに至っている。
【０００４】この両面発電型太陽電池セルを用いた太陽電池発電施設においては、従来と同じようにセルを詰め込んだモジュールや、これを互いに密接して並べた太陽電池アレイが設置され、モジュールや太陽電池アレイの下縁からその下側に入射し、地面や屋根瓦などで乱反射された散乱光が両面発電型太陽電池セルの裏面に入射するようにしている。
【０００５】
【発明が解決しようとする課題】しかしながら、モジュールや太陽電池アレイの上側ではモジュールや太陽電池アレイが影を作り、セルの裏面側に入射する光が少なく、又、弱くなるので、セル１個当たりの発電効率は期待されるほど高められず、片面発電の場合と同じ位のセル数が必要とされ、セル数の削減によるコストダウンやモジュールの軽量化を図ることがあまり期待できない、という課題がある。

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【０００６】本発明は、この従来技術の課題を解決し、セル１個当たりの発電量を増大させ、セル数を削減してコストダウンやモジュールの軽量化を図れるようにした太陽電池モジュールを提供することを目的とする。
【０００７】
【課題を解決するための手段】この目的を達成するため、本発明は、それぞれ複数の両面発電型太陽電池セルを一方向に接近させて並べた複数のセル列と、隣接するセル列を前記一方向に直交する方向に離隔することにより形成されたセル列の間で前記一方向に延びる透光部と、この透光部を表側から裏側に透過した光を太陽電池セルの裏面に入射させることを特徴とする。
【０００８】本発明は、前記透光部を表側から裏側に透過した光を太陽電池セルの裏面に反射させる反射板を更に備えるとよい。
【０００９】これによれば、モジュールの表側に入射した光の一部は直接にセルの表面に入射し、残りは透光部を透過して反射板に入射する。反射板に入射した光の一部は透光部に向かって反射するが、残りはセルの裏面に反射される。
【００１０】透光部はセル列の間に配置されているので、モジュールの各セルの裏面に同じように光が入射することになり、各セルが同じように裏面から入射した光により発電する結果、セル１個当たりの発電量が増大し、セル数を削減しても充分な発電量が得られるようになる。
【００１１】セルを接近させて並べる方向は特に限定されず、水平方向であっても、これと直交する上下方向であってもよい。
【００１２】反射板が透光部を透過してきた光を反射する反射面は、反射光を散乱させるように粗面であってもよいが、できるだけ多量の光がセル裏面に向かって反射されるように、鏡面であってもよい。
【００１３】又、セルが水平方向には接近し、上下方向には離隔するように配置されたモジュールを垂直に立てて設置する場合は、反射板が太陽電池セルの下縁の高さで太陽電池セル側に突出する突出部を有すると、上側の透光部から入射し、下側の透光部に向かって反射された光を突出部で再反射させてセルの裏面に入射させて発電量を増加させることができるので有利である。
【００１４】ところで、この両面発電型太陽電池セルを用いるモジュールでは、セルを表面保護用の透明板と裏面保護用の透明フィルムとの間に樹脂封止しているが、この透明フィルムが透過光を散乱させるようにしてあれば、反射板で反射され、透光部を透過してモジュールの

表側に出射する光のまぶしさを減衰させることができる。例えばフィルム成形時やフィルム成形後のエンボス加工などによる凹凸を形成すると、透光部を透過して反射板に入射する光量をほとんど減少させることなく、この透明フィルムを透過するときに光を散乱させることができる。

【００１５】

【発明の実施の態様】以下、本発明の一実施例に係る両面発電型太陽電池モジュールを図面に基づいて具体的に説明する。

【００１６】図１の斜視図に示す太陽光発電装置では、本発明の一実施例に係る太陽電池モジュール１が上面を東上がりに傾斜させた架台２上に南北に２枚並べて配置され、各モジュール１には、例えばＨＩＴ太陽電池からなる複数（例えば１２個）の両面発電型太陽電池セル３を上下方向、即ち、東西方向の一方向に接近させて並べた複数（例えば４列）のセル列４と、隣接するセル列４を前記一方向に直交する水平方向、即ち、南北方向に離隔することにより形成されたセル列４の間で前記一方向に延びる透光部５とが設けられている。

【００１７】この透光部５の幅は例えば８８ｍｍであり、左右両端のセル列４と後述するフレーム１４との間にも同じ間隔が置かれている。

【００１８】図２の平面図に示すように、各列の両面発電型太陽電池セル３は銅箔に半田めっきをした銅箔リード６により直列に接続され、各セル列４は例えばモジュールの裏面に設けた端子ボックス７内に設けた１対の端子間に銅箔リード６で例えば直列に接続される。

【００１９】図３の断面図に示すように、これら両面発電型太陽電池セル３及び銅箔リードは、例えばガラスからなる透光性表面材８と、例えばポリエチレンテレフタレート（ＰＥＴ）からなる透光性裏面材９との間に例えばエチレンビニルアセテート（ＥＶＡ）からなる樹脂１０で封止され、これら透光性表面材８、透光性裏面材９及び樹脂１０とともに透光性モジュール１１を構成する。

【００２０】この透光性モジュール１１の裏面側に適当な空間を隔てて耐火材、例えばアルミニウム板からなる反射板１２が配置され、この反射板１２の透光性モジュール側の面、即ち、表側の面で鏡面仕上げした反射面１３が構成される。

【００２１】そして、これら透光性モジュール１１と、反射板１２と、これらを組込んだ例えばアルミニウム押出し型材からなるフレーム１４とで、例えば上下方向の長さ１３２０ｍｍ、水平方向の幅８９５ｍｍの外形寸法（以下、標準寸法と言う。）を備える前記太陽電池モジュール１が構成される。

【００２２】このように、透光部５を設けて、１２個のセル３からなるセル列４を４列設けた各モジュール１は４８個のセル３を用いることになり、標準寸法の従来のモジュールでは、１２個のセル３からなるセル列４が８列配置され、合計９６個のセル３が用いられるのに対して、５０％のセル３が削減されることになる。

【００２３】さて、前記太陽光発電装置に太陽光が入射すると、その一部分は直接に各セル３に表側から入射し電気に変換される。残りの太陽光は透光部５を透過して反射板１２に入射し、反射面１３で反射される。この反射光の一部は先に通ってきた透光部５やその他の透光部５を通って表側に出射するが、少なくとも一部の反射光は間近のセル３の裏面に入射し、電気に変換される。

【００２４】ここで、透光部５はセル列４の間に配置されているので、モジュール１の各セル３の裏面に同じように光が入射することになり、各セル３が同じように裏面から入射した光により発電する結果、セル１個当たりの発電量が増大し、セル数を削減しても必要な発電量が得られるようになる。

【００２５】この実施例の太陽電池出力は１２２Ｗになり、上述した９６個のセル３を用いた従来の片面発電型のモジュールの太陽電池出力が１８０Ｗであるのに対して、６７．８％の出力が得られたのであり、明らかにセル１個当たりの発電量が高められている。従って、所要の出力を得るに要するセル数を削減して、コストダウンを図ることができると共に、モジュールの軽量化を図ることができる。

【００２６】本発明において、１枚のモジュール１に用いるセル３の数は特に限定されず、例えば標準寸法のモジュール１では、１２個のセル３を並べたセル列４を３列ないし７列配置することにより、セル１個当たりの発電量を高め、所要の出力を得るに要するセル数を削減して、コストダウンを図ることができると共に、モジュールの軽量化を図ることができる。

【００２７】具体的には、セル列４を７列にすれば、８４個（従来例の８７．５％）のセル３で１７７．３５Ｗ（従来例の９８．５％）、セル列４を６列にすれば、７２個（従来例の７５％）のセル３で１６３．４９Ｗ（従来例の９０．８％）、セル列４を５列にすれば、６０個（従来例の６２．５％）のセル３で１４４．９Ｗ（従来例の８０．５％）、セル列４を３列にすれば、３６個（従来例の３７．５％）のセル３で９６．２Ｗ（従来例の５３．４％）の出力が得られる。

【００２８】この実施例においては、前記反射面１３を鏡面に仕上げているが、これに代えて白色塗装やクリア塗装などの高反射加工を施すことにより反射面１３の反射効率を高めるようにしてもよい。

【００２９】又、これと反対に、ヘアライン加工、シボ加工、エンボス加工などにより、反射面１３を粗面ないし凹凸面に形成し、反射面１３で反射された反射光を散乱させることも可能である。この場合には、セル３の裏面に入射する光量を均一化して、むらなくセル特性を高めることができるとともに、反射面で反射され、透光部

５を通ってモジュール１から出射される光のまぶしさが抑えられる。特に、図４の斜視図及び図５の断面図、或いは図６の斜視図及び図７の断面図に示すように、エンボス加工などにより反射板１２を凹凸させることにより反射面１３を凹凸面に形成する場合には、反射板１２の強度が高められるという効果も得られる。

【００３０】更に、この実施例では、反射板１２を不燃材であるアルミニウム板で構成しているので、耐火性能が高く、耐火性が要求される外壁材や屋根葺き材としても利用することができる。

【００３１】加えて、この実施例において、例えば図８の断面図に示すように、透光性裏面材９を例えばエンボス加工により凹凸させても、反射面で反射され、透光部５を通ってモジュール１から出射される光のまぶしさを抑えることができる。

【００３２】なお、このモジュール１を南向きに配置すると、南中時にはセル３の裏側に入射する光量が最低になるが、若干の光が回折作用によりセル３の裏側に回り込み、反射面１３で反射されてセル３の裏面に入射する。又、南中時以外には透光部５を透過し、反射面１３で反射した光がセル３の裏面に入射することが期待でき、一日を通じて多くの時間帯に渡り発電量の変動が少ない安定した発電量が得られる。

【００３３】図９の正面図及び図１０の断面図に示す本発明の他の実施例に係る両面発電型太陽電池モジュール１では、セル３を水平方向に接近して並べたセル列４が上下方向に間隔をあけて配置される。

【００３４】この実施例において、例えば図１１の断面図に示すように、反射板１２が太陽電池セル３の下縁の高さで太陽電池セル３側に突出する突出部１５を設け、モジュール１を垂直に立てて設置すると、前記反射面１３で反射され、セル３の下側の透光部５に向かう光が突出部１５の上面で反射されてセル３の裏面に入射することになり、透光部５を裏面側に透過した光の利用率が高められるので有利である。

【００３５】この突起部１５は、例えば一体押出し成形により反射板１２に一連に形成されているが、反射板１２の他の部分と別体に形成したものでもよく、又、例えば図１２の断面図に示すように反射板１２を連続波形に折り曲げることにより形成してもよいのである。

【００３６】この場合、反射面１３の斜め上向きの部分を凸曲面に形成したり、凹曲面に形成したりすることにより反射光の反射方向を制御し、透光部５を透過した光の全てをセル３の裏面に全面にわたって均等に入射させることができる。

【００３７】この実施例のその他の構成、作用ないし効果は前例と同様であるので、重複を避けるために省略する。

【００３８】上記した実施形態においては、反射板により透光部を表側から裏側に透過した光を太陽電池セルの裏面に反射させるように構成したが、反射板を設けずに、透光部から表側から裏側に透過した光を地面や屋根瓦或いはビルの壁面等で散乱反射させ、その光を入射させるように構成することもできる。

【００３９】

【発明の効果】以上に説明したように、本発明の太陽電池モジュールは、それぞれ複数の両面発電型太陽電池セルを一方向に接近させて並べた複数のセル列と、隣接するセル列を前記一方向に直交する方向に離隔することにより形成されたセル列の間で前記一方向に延びる透光部と、この透光部を表側から裏側に透過した光を太陽電池セルの裏面に反射する反射板とを備えるので、各セルの裏面に透光部を透過し、反射板で反射させた光を入射させることにより、セルが配置されている位置に関係なくセルの両面に光を入射して発電させることができ、セル１個当たりの発電量を高めることができる。

【００４０】その結果、モジュール１枚当たりのセル数を少なくして、モジュールの価格を安価にでき、又、モジュールを軽量化することができるなどの効果を得ることができるのである。

【図面の簡単な説明】

【図１】本発明を用いた太陽電池施設装置の斜視図である。

【図２】本発明の正面図である。

【図３】図１のＡ－Ａ線断面図である。

【図４】本発明の反射板の斜視図である。

【図５】図４のＢ－Ｂ線断面図である。

【図６】本発明の反射板の斜視図である。

【図７】図６のＣ－Ｃ線断面図である。

【図８】本発明の断面図である。

【図９】本発明の正面図である。

【図１０】図９のＤ－Ｄ線断面図である。

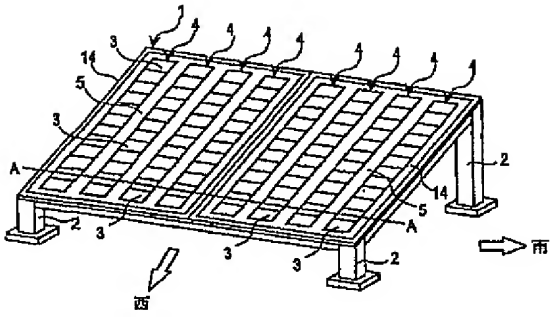
【図１１】本発明の断面図である。

【図１２】本発明の断面図である。

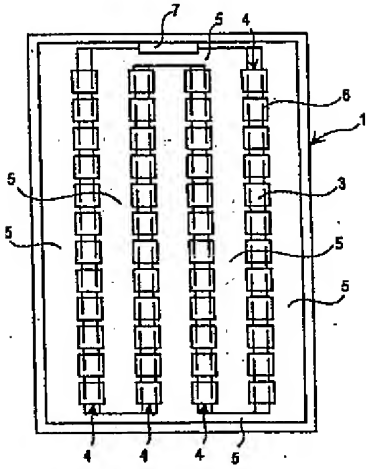
【符号の説明】

１　両面発電型太陽電池モジュール
３　太陽電池セル
４　セル列
５　透光部
１２　反射板
１５　突出部

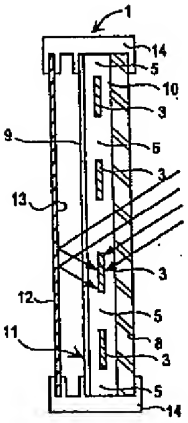
【図１】



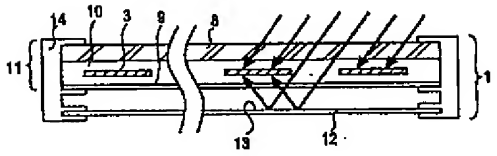
【図２】



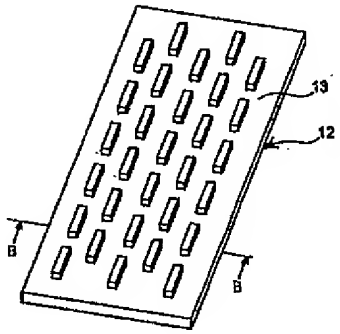
【図１０】



【図３】

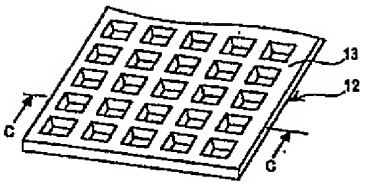


【図４】

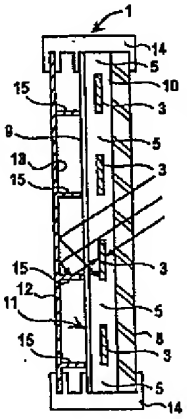


【図５】

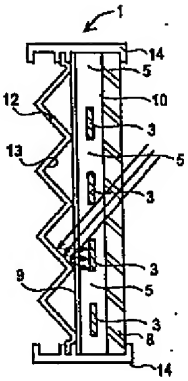
【図６】



【図１１】

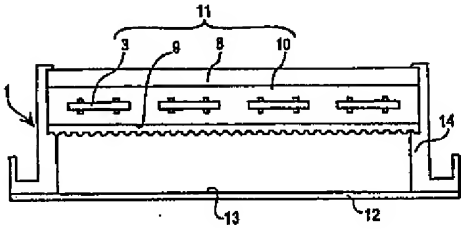


【図１２】



【図７】

【図８】



【図９】